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ABSTRACT

Teachers' attitudes play a critical role in the effectiveness of technology. The Technology Attitude Survey (TAS) was developed to assess teachers' attitudes toward the general use of technology as an educational tool in the classroom. Reliability and validity of the TAS were investigated. A small pilot study showed high reliability. Pretest and posttest data were then collected from 86 foreign language teachers participating in a training program on the use of technology to enhance foreign language instruction. A single underlying factor explained item intercorrelations. Reliability for the measure was high. Validity was supported by moderate correlations with the computer competency scale of the Teacher Effectiveness Scales. The TAS appears to be a reliable measure of teachers' attitudes toward technology. The Scale is attached. (Contains two tables and eight references.) (Author/SLD)

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TEACHERS' ATTITUDES TOWARD TECHNOLOGY: PSYCHOMETRIC EVALUATION OF THE TECHNOLOGY ATTITUDE SURVEY

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Abstract

Teachers' attitudes play a critical role in the effectiveness of technology. The Technology Attitude Survey (TAS) was developed to assess teachers' attitudes toward the general use of technology as an educational tool in the classroom. Reliability and validity of the TAS were investigated. A small pilot study showed high reliability. Pretest and posttest data were then collected from 86 foreign language teachers participating in a training program on the use of technology to enhance foreign language instruction. A single underlying factor explains item intercorrelations. Reliability for the measure was high. Validity was supported by moderate correlations with the computer competency scale of the Teacher Effectiveness Scales (TES). This new scale is a reliable measure of teachers' attitudes toward technology.

Tremendous advances in technology lead today's classrooms to little resemble the classrooms of several decades ago. Technology represents not the singular addition of a computer in the corner of the room but a major shift in the philosophical approach to education as well as the topology of a classroom. Most people involved in education welcome the promise of a better education that technology brings. Students are eager to manipulate the icons and images on a computer screen. Administrators and policy makers are anxious to promote the educational opportunities saturated in the most up-to-date technology that their schools and programs provide. Teachers are swiftly becoming managers of classroom technology. A critical juncture in whether or not technology will successfully enhance the educational process is the attitude of the teacher using the technology. This attitude has remained relatively unexamined.

Although many technological applications in education are computer-based, for example hypermedia, interactive media, adaptive media, and discursive media (Laurillard, 1993), their potential for classroom use projects the idea that technology is much more than groupings of terminals, processors, keyboards, and mice. Their seemingly endless possibilities alone can be intimidating. However, according to Laurillard, education is interactive and therefore, for most technological applications currently available, the teacher is an essential part of the educational process. He or she provides instrumental feedback at several points in the process to ensure that learning is taking place.

Teachers' attitudes toward computers have been assessed on a number of occasions under varying circumstances. Lowther and Sullivan (1994) indicated that teachers' attitudes toward computers and the use of computers vary greatly. A review by Kluever, Lam, Hoffman, Green, and Swearingen (1994) revealed that attitudes toward computers have distinct evaluative and

affective components. The Computer Attitude Scale (CAS) developed by Loyd and Loyd (1985) is useful but limited to teacher attitudes toward computers. Lowther and Sullivan (1994) acknowledge as important teachers' needs, wants, beliefs, and practices, as well as variations in classroom settings in developing technological solutions for them. They designed a survey to assess teacher and educational technologist perceptions toward educational technology. One of the five scales of the survey includes five items on computers and media. Four of the five items elicit strength of agreement responses to statements regarding computer-related instruction and the fifth to media-related instruction, such as film and video. This survey, too, is limited in its application to attitudes of teachers to technology in general.

Davis (1993) developed a Technology Acceptance Model (TAM), which has proved useful in explaining and predicting attitudes toward technology in the business world. His model assumes that one's attitude toward technology comprises two components. The first component is usefulness, which is defined as the degree to which a person believes that using a particular system will enhance job performance. The second component is ease of use, which is defined as the degree to which a person believes using a particular system is free of effort. His model was supported by the results of his study and validated in a separate study by Szajna (1994). As it applies to the educational process, his model does not account for an aspect which may influence teachers' attitudes toward technology. That aspect is whether or not a technological application facilitates learning. His model provides meaningful insights into the components that comprise attitudes toward technology but misses the educational utility dimension as a model of teachers' attitudes toward technology.

The current paper addressed the psychometric quality of the Technology Attitude Scale

(TAS). The TAS was developed to assess teachers' attitudes toward technology in general. The TAS differs from Loyd and Loyd's CAS because it assesses a teacher's attitude toward numerous technologies rather than just computers. The TAS differs from Lowther and Sullivan's scale because it generalizes to all technologies useful in the classroom rather than just computers, film, and video. The TAS differs from Davis' TAM because it includes the educational utility component considered important to teachers' attitudes.

Method

Subjects

This study was accomplished as part of a project entitled Technology Training for Foreign Language Teachers (TTFLT). The purpose of the project was to demonstrate an effective, university-based program to train K-12 foreign language teachers in state-of-the-art technology for foreign language classroom instruction. The study was carried out in two stages. During the first stage the instrument was administered to a small cadre of 17 foreign language instructors before and after their participation in the training program. In the second stage the instrument was administered to 86 foreign language instructors before and after their participation in the training program. Of the 86 instructors, 13 were men (16%) and 73 were women (84%) from 36 schools throughout the greater Denver metropolitan area.

Instruments

The Technology Attitude Scale (TAS) is an instrument developed by program staff as an evaluation measure for the TTFLT project. The TAS consists of 20 items with responses provided on a seven-point Likert scale, ranging from "Not True" to "Very True."

The Teacher Effectiveness Scales (TES) contain a total of 40 items. One scale is a

computer competency scale. It consists of 22 items and addresses the use of computers in the classroom. Reliability for the computer competency scale is .96 for the current sample. The other scale is a classroom management scale. It consists of 18 items and addresses general classroom teacher competencies. Reliability for the classroom management scale is .91. Teachers rate themselves using a five-point Likert scale as unskilled, inconsistent, competent, highly skilled, or at the mastery level for each item of each scale. This measure was included to provide an indication of validity of the TAS.

Procedure

Instructors for the TTFLT project were K-12 foreign language teachers. Seventeen foreign language resource teachers from Denver were trained in a series of nine monthly workshops during the first year of the project. Nine of these 17 resource teachers comprised the initial cadre of instructors who trained almost ninety teachers organized into six geographic clusters during the second year of the project. To ensure a sufficient number of participants, the project scope was expanded to include four suburban schools. The second year of the project followed a similar format to the first although scheduling of the training sessions was more flexible. Participants attended nine workshops and two full days of instruction at the University of Denver. Content was "hands-on" training in the use of hardware and software. Teachers were taught how to use word processing, graphics, database, spreadsheet, and animation software. They were also taught how to use the following types of hardware: overhead projectors, VCRs, laserdisc players, and camcorders. Finally, teachers were taught to use technology that combines hardware and software: barcodes, scanners, networks, modems, printers, CD-ROM drives, LCD palette units, MINITEL, digital cameras, and telecommunications equipment. Both the initial

cadre and the 86 foreign language resource teachers were given the Technology Attitude Scale and Teacher Effectiveness Scales as pre- and posttest measures as part of program evaluation. These instruments were administered in a group setting prior to the day's training in September and again in May.

Results

Pilot Group

During the first year of the TTFLT project, the Technology Attitude Survey (TAS) was administered to a small sample of foreign language teachers before and after they received program training. Cronbach alpha reliabilities for the TAS were .92 and .95, respectively, with no items identified as detracting from scale reliability. Thus, no changes to the scale were made prior to the second year of the project.

Full Study

Principal components analyses were computed on pretest and posttest data collected from the 86 foreign language teachers who participated in the second year of the project. Results of the pretest data analysis suggest that a single dimension explains item intercorrelations. All but two items had factor loadings of .4 or greater. Analyses were rerun without those two items. The single dimension accounted for 43% of the variance. Reliability was .92. Principal components analysis of the posttest also showed high loadings on a single factor with one of the remaining 18 items falling slightly below .4. The single factor accounted for 32% of the variance. The reliability for the posttest data was .85. Pretest and posttest factor loadings on the unrotated first factor are presented in Table 1 as are the item-total correlations. Score distributions for items tended to be negatively skewed in both the pre- and posttest administrations. The test-

retest reliability for the TAS was .53, $p<.001$.

Table 1. Unrotated Factor Loadings and Item-Total Correlations

	Pretest		Posttest	
Item	Loading	Item-Total Correlations	Loading	Item-Total Correlations
1	.58	.60	.65	.45
2	.81	.81	.71	.61
3	.72	.70	.74	.68
4	.58	.56	.65	.37
5	.56	.56	.68	.21
6	.81	.77	.75	.50
7	.67	.53	.68	.47
8	.64	.42	.68	.51
9	.59	.65	.65	.49
10	.77	.65	.55	.40
11	.74	.71	.63	.61
12	.64	.63	.38	.35
13	.78	.59	.52	.47
14	.60	.36	.71	.46
17	.53	.53	.44	.42
18	.64	.62	.73	.60
19	.84	.78	.71	.51
20	.59	.51	.57	.49
Eigenvalue	8.05		5.79	
% Percent Variance	44.70		32.20	
Reliability	.92		.85	

Support for validity was evidenced by significant correlations among the pre- and posttest TAS scores and the pre- and posttest computer competency scale scores on the Teacher Effectiveness Scales (Table 2). As anticipated, correlations among the pre- and posttest Technology Attitude Survey and the general classroom management scale of the Teacher Effectiveness Scales were not significant at pretest and substantially lower than the correlation with computer competency at posttest. As a further note, TAS scores were correlated with

ratings of whether a teacher's school would provide sufficient funds to maintain interest in technology, ($r = .36$, $p < .001$), and whether teachers' see themselves as a resource for other teachers, ($r = .33$, $p < .05$). No significant differences were found in TAS scores between males and females or among schools.

Table 2. Correlations between TAS and TES pre- and posttest factors

	Technology Attitude Survey (TAS)	
	Pretest	Posttest
Teacher Effectiveness Scales (TES)		
Pretest		
Computer Competency	.59**	
Classroom Management	.11	
Posttest		
Computer Competency		.54**
Classroom Management		.27*

*$p<.05$ **$p<.01$

Discussion

The results of this study indicate that the Technology Attitude Survey is a reliable measure of teachers' attitudes toward technology in general. This study also found support for the validity of the TAS. Moderate correlations were found between the TAS and the computer competency scale of the Teacher Effectiveness Scales at both pre- and posttest.

The Technology Attitude Survey demonstrates that a single factor underlies the attitudes measured. This is at variance with Davis's (1993) two-factor Technology Acceptance Model. The constructs assessed by each measure are not the same. Davis's model seems to measure the reasons people have a positive or negative attitude toward technology; technology is useful or

not useful and technology is easy or not easy to use. The TAS assesses the positive and negative aspects of one's attitude toward technology.

A limitation of this study was the sample used. The number of participants in the project was small. They were predominantly female foreign language instructors from mostly urban schools in the Denver area. Their willingness to participate may signify a different population than random sampling might yield.

There are few, if any, psychometrically sound measures of teachers' attitudes toward technology in general. Of those existing measures, most focus on the computer or video and film technologies in the classroom. The Technology Attitude Survey shows promise as a measure either to identify training needs or to evaluate formal training. It may also be used as an index of teacher support prior to implementation of a technology change effort.

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TECHNOLOGY ATTITUDE SCALE

Below is a series of statements. There are not correct answers to these statements. They have been set up in a way which permits you to indicate the extent to which the idea expressed is true or not true of you. Please use the following scale:

1 = Not all true of me. ***7 = Very much true of me.***

By technology, we mean computers, CD-ROMs, laserdisc players, databases, etc.

NAME: _____
SCHOOL: _____

	NOT TRUE						VERY TRUE
1. Knowing how to use technology is a necessary skill for me.	1	2	3	4	5	6	7
2. I like using technology.	1	2	3	4	5	6	7
3. I feel confident with my ability to learn about technology.	1	2	3	4	5	6	7
4. Working with technology makes me nervous.	1	2	3	4	5	6	7
5. I now use my knowledge of technology in many ways as a teacher.	1	2	3	4	5	6	7
6. I like using technology in my work.	1	2	3	4	5	6	7
7. I wish I could use technology more frequently.	1	2	3	4	5	6	7
8. Technology makes me feel stupid.	1	2	3	4	5	6	7
9. A job using technology would be very interesting.	1	2	3	4	5	6	7
10. I don't expect to use technology much at work.	1	2	3	4	5	6	7
11. I'm not the type to do well with technology.	1	2	3	4	5	6	7
12. I feel uncomfortable using most technology.	1	2	3	4	5	6	7
13. Working with technology is boring.	1	2	3	4	5	6	7
14. Learning about technology is a worthwhile and necessary subject for all prospective teachers.	1	2	3	4	5	6	7
15. It is important to know how to use technology in order to get a teaching position.	1	2	3	4	5	6	7
16. I know that if I work hard to learn about technology, I will do well.	1	2	3	4	5	6	7
17. I am able to do as well working with technology as my fellow TTFLT teachers.	1	2	3	4	5	6	7
18. I think using technology will be difficult for me.	1	2	3	4	5	6	7
19. Technology makes me feel uneasy and confused.	1	2	3	4	5	6	7
20. Once I start using technology, I will find it hard to stop.	1	2	3	4	5	6	7

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